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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
VU, MINDY D	
ART UNIT	PAPER NUMBER
2884	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/541,559	GAGNON, DANIEL
	Examiner	Art Unit
	Mindy Vu	2884

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16,18-28 and 30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16,18-28 and 30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 July 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to Applicant's amendment filed June 04, 2007.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-6, 8-9, 13-15, 18, 20, 23-24, 26-28 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashburn (US 6,147,352) in view of Gagnon et al. (EP 1008865, hereafter Gagnon).

3. With respect to independent Claim 1, Ashburn discloses a nuclear camera capable of performing SPECT imaging (Abstract), the nuclear camera including: a rotatable gantry defining a gantry rotation axis 100 and an imaging isocenter (Fig. 4); and a gamma detector arranged on the rotating gantry at a constant fixed radial distance from the imaging isocenter to circularly and non-conformally orbit the imaging isocenter at the constant fixed radial distance (Col. 3 lines 59-65), the gamma detector including a radiation-sensitive surface (abstract).

Ashburn omits a collimator. Gagnon discloses a collimator is known for permitting a greater percentage of incident radiation to reach the surface of the detector (Paragraph 0011). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a collimator for detection purposes.

With respect to Claim 2, Gagnon discloses a plurality of spaced-apart slats 102 arranged traverse to the radiation detection surfaces 106 and defining viewing planes between each slat pair (Fig. 3).

With respect to Claim 3, Gagnon discloses a motor 136 for spinning the collimator and the radiation sensitive surface about a slat rotation axis 109 that is perpendicular to the gantry rotation axis (Paragraph 0042).

With respect to claim 4, Gagnon teaches all the limitations of parent claim 3, as discussed above. Further, Gagnon teaches that the slats have a spacing G, a height Wz, a width Wy, and a thickness Wx that must be specified for the detector (paragraph 56). Gagnon further teaches that the ratio of the spacing to the height is selected to provide a desired spatial resolution and the width is selected to provide a desired detector sensitivity (paragraph 57). Thus, Gagnon already teaches optimization of the collimator dimensions based on desired resolution and sensitivity. Gagnon et al. do not discuss the affect of imaging time, radial distance, or slat pair. However, each of these variables is directly influenced by or influences detector sensitivity and detector resolution. Sensitivity directly impacts imaging time. Radial distance directly affects resultant resolution and sensitivity. Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to optimize the collimator parameters based on imaging time, radial distance, and slat pair as well as resolution and sensitivity, since these variables are related to the resolution and sensitivity of the detector.

With regards to claim 5, Gagnon already teach optimization of the collimator height based on desired resolution. Gagnon does not discuss that the height corresponds to a ratio of the fixed radial distance and the selected resolution. However, as noted above, the radial distance directly influences the detector resolution and sensitivity, i.e. greater radial distances result in decreased resolution. Thus, it would have been obvious optimize the collimator height based on the fixed radial distance and the desired resolution, since these variables are integrally related.

With respect to Claim 6, Gagnon discloses the radiation sensitive surface consist of an array of individual solid-state detector elements 106a... 106n (Paragraph 0045).

With respect to Claim 8, Gagnon discloses that 4 or more detector heads may be used (Paragraph 0040).

With respect to Claim 9, Ashburn suggests a plurality of detectors 124 are positioned at different fixed location along the carrier member (Col. 7 lines 24-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to place at least a pair of radiation detectors 24 oppositely mounted on the rotatable gantry that are configured to perform coincidence detection of radiation emitted during positron electron annihilation.

With respect to independent Claim 13, Ashburn discloses a nuclear camera (Abstract) including: at least four SPECT radiation detectors 124 (Ashburn suggests a plurality of detectors, Col. 7 lines 24-31) rotatably arranged around an imaging region to receive emission radiation, the radiation detectors each disposed an equal constant

fixed distance from an imaging isocenter, the radiation detectors each including a radiation sensitive surface (Fig. 9).

Ashburn omits a collimator. Gagnon discloses a collimator is known for permitting a greater percentage of incident radiation to reach the surface of the detector (Paragraph 0011). In addition, Gagnon discloses a slat collimator 102 disposed on each radiation detector 22 between the detector and the imaging region to provide planar collimation, and a motor 136 for spinning the collimator and radiation sensitive surface (Fig. 3) of each detector Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a slat collimator and the recited structure as suggested by Gagnon for detection purposes.

With respect to Claim 14, Ashburn discloses a generally circular rotatable gantry on which the radiation detectors are dispose; and an optically opaque housing that is substantially transmissive for the first emission radiation (Col. 4 lines 2-33).

With respect to Claim 15, Ashburn discloses the radiation detectors configured for at least one the recited (Col. 7 lines 7-14).

With respect to independent Claim 18, Ashburn discloses a radiological imaging method (abstract) including: circularly orbiting at least one radiation detector about an imaging volume at a fixed radial distance from a first axis of rotation through the imaging volume (Fig. 4); detecting radiation from the imaging volume at a generally planar radiation sensitive region of the radiation detector, the radiation sensitive region facing the imaging volume during the fixed radius circular orbiting (Col. 7 lines 7-26).

Ashburn omits a collimator. Gagnon discloses a collimator is known for permitting a greater percentage of incident radiation to reach the surface of the detector (Paragraph 0011). In addition, Gagnon discloses spinning a slat collimator 102 and the radiation sensitive array 06 about an axis 109 perpendicular to axis 70 during the circular orbiting, integrating the radiation detected over planar regions defined by the slat collimators to generate projection views, and reconstructing the image representation of the imaging volume from the plane integral projection views (Paragraph 0042). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a slat collimator and the recited structure as suggested by Gagnon for detection purposes.

With respect to claim 20, Gagnon teaches the detectors have a length Cx, width Cy, and height Cz that must be specified for the detector (paragraph 56). Gagnon further teaches that the energy resolution, sensitivity, cost, and leakage are all influenced by the detector dimensions (paragraph 57)., Gagnon also teaches that the sensitivity of the detectors is related to the Cy + 2Cz (paragraph 49). Thus, it would have been obvious to select a minimum width Cy of the detector elements to provide a selected sensitivity, since Gagnon et al. teach that the width and height of the detector elements are directly related to the detector sensitivity.

With respect to Claim 23, Ashburn discloses disposing a radiation-transmissive, optically opaque shield 84 between the detector 24 and the imaging volume which remains stationary during orbiting and blocking optical communication between the

imaging volume and the radiation detector during orbiting (Col. 4 lines 2-7; Col. 6 lines 53-60).

With respect to Claim 24, Ashburn discloses orbiting at least four radiation detectors at the fixed radial distance (Col. 7 lines 24-26).

With respect to independent Claim 26, Ashburn discloses an imaging apparatus (abstract) comprising: a rotatable gantry defining a gantry rotation axis 100 and an imaging isocenter (Fig. 4); three or more gamma detectors arranged on the rotatable gantry at a fixed radial distance from the imaging isocenter (Col. 7 lines 24-26).

Ashburn omits a collimator. Gagnon discloses a collimator is known for permitting a greater percentage of incident radiation to reach the surface of the detector (Paragraph 0011). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a collimator for each of the detectors for detection purposes. In addition, Gagnon also discloses a means 140 for processing data selected by the detectors to produce an image (Paragraph 0042). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a processor in Ashburn for computing the radiation detected by the detectors.

With respect to Claim 27, Gagnon discloses each of the collimators includes a plurality of spaced-apart slats 106a...106n and a motor 136 for spinning the slats about a rotation axis 109.

With respect to independent Claim 28, Ashburn discloses an imaging apparatus (abstract) comprising: at least four SPECT radiation detectors 124 (Ashburn suggests a plurality of detectors, Col. 7 lines 24-31) rotatably arranged around an imaging region, each detector disposed an equal constant fixed and non-adjustable distance from an imaging isocenter (Fig. 9).

Ashburn omits a collimator for each detector. Gagnon discloses a collimator is known for permitting a greater percentage of incident radiation to reach the surface of the detector (Paragraph 0011). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a collimator for each of the detectors for detection purposes.

Gagnon discloses a slat collimator 102 wherein the slat spacing G and the slat height Wz are selected to provide a desired spatial resolution (paragraph 58), and the detector has a width Cy. Gagnon further teaches that the energy resolution, sensitivity, cost, and leakage are all influenced by the detector dimensions (paragraph 57). Gagnon also teaches that the sensitivity of the detectors is related to the Cy + 2Cz (paragraph 49). Thus, it would have been obvious to select a minimum width Cy of the detector elements to provide a selected sensitivity, since Gagnon et al. teach that the width and height of the detector elements are directly related to the detector sensitivity.

With respect to Claim 30, Gagnon discloses each of the collimators includes a plurality of spaced-apart slats 106a...106n and a motor 136 for spinning the slats about a rotation axis 109.

Claims 7, 19, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashburn (US 6,147,352) in view of Gagnon et al. (EP 1008865, hereafter Gagnon) and further in view of Ichihara (US 5,055,687).

With respect to claim 7, Gagnon teaches all the limitations of parent claim 6, as discussed above. Gagnon further discloses that transmission radionuclide imaging may be used for attenuation correction (paragraph 71). However, Gagnon is silent with regards to the specific structure employed in transmission imaging for attenuation correction, namely a radiation source on the rotating gantry and a transmission radiation detector mounted opposite thereto. Ichihara discloses a SPECT system (Figure 6) with attenuation correction wherein a radiation source 12-1 is disposed on the gantry and a transmission radiation detector 10-2 arranged opposite thereto to detect the transmitted radiation. The acquired attenuation data can then be used to compensate the SPECT image for absorption in the patient (column 1, lines 31- 39; column 2, lines 4-10; column 4, lines 16-26). Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to include radiation source and transmission radiation detector on the rotating gantry to enable attenuation correction of the SPECT data with high accuracy, as taught by Ichihara.

With respect to claim 19, Ashburn and Gagnon disclose all the limitations of parent claim 18, as discussed above. Ichihara further teaches that in SPECT imaging the detector heads may be rotated around the gantry by an angle of 360°/N, where N is the number of detector heads (column 1, lines 22-25). In the example illustrated in Fig. 1 of Gagnon, three detector heads 22 would then be rotated about 360°/3 or 120°.

Thus, the detector heads would occupy a common location only once in the orbiting (i.e. detector 22a would occupy the spot of detector 22¢ after a 120° rotation). Thus, the collimator should be spun 180° or 360° at each location. Although Gagnon doesn't specifically disclose the angle of spinning of the collimator and detector, Figure 9C of Gagnon would suggest the spinning over 360°.

With respect to claim 21, Ashburn is silent with regards to the angle orbited by the radiation detectors. Ichihara suggests that in SPECT imaging, the detector heads are rotated by an angle of 360° divided by the number of detectors (column 1, lines 22-25). It would have been obvious to one having ordinary skill in the art at the time the invention was made to choose an angle of rotation of 180° divided by the number of detectors, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272,205 USPQ 215 (CCPA 1980).

With respect to claim 22, Gagnon further teaches that the collimator spacing G and the collimator height Wz are selected based on desired resolution. Gagnon does not discuss selecting the collimator dimensions based on radial distance. However, the radial distance of the detector directly influences detector resolution. Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to optimize the collimator parameters based on radial distance as well as resolution, since radial distance directly affects resolution.

Claims 10 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashburn (US 6,147,352) in view of Gagnon et al. (EP 1008865, hereafter Gagnon) and further in view of Gagnon et al. (US 6,177,675, hereafter Gagnon '675).

With respect to Claims 10 and 25, Gagnon is silent with regards to the gamma detectors being collimated for at least two different imaging resolutions. Gagnon does not discuss the probability of using detectors with different resolutions although Gagnon does discuss the dependence of resolution on the collimator geometry. Gagnon '675 teaches a gamma camera system (Figure 1) similar to that proposed by Gagnon. In such a system, each detector head 15 has a collimator 30 that defines a different resolution (abstract). As pointed out by Gagnon '675, such a system provides better image quality and added versatility and flexibility in selecting and viewing images of a patient from a single imaging scan (column 8, lines 39-42). Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to provide detector heads with different resolution so as to provide a system with better quality, versatility, and flexibility, as taught by Gagnon '675.

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marks (US 5,391,877) in view of Ashburn (US 6,147,352) and further in view of Gagnon et al. (EP 1008865, hereafter Gagnon).

With respect to independent Claim 11, Marks discloses a nuclear camera (abstract) including a rotatable gantry defining a gantry rotation axis and an imaging isocenter (Fig. 1); a first generally toroidal housing 14 substantially enclosing the

rotatable gantry and the detectors (Col. 2 lines 33-37). Marks is silent about how the detectors are placed inside the toroidal housing. Ashburn discloses an arrangement to keep the detectors at a constant fixed radial distance from the imaging isocenter along the carrier member 26 (Figs. 1, 4, 9 & Col. 7 lines 24-26). Ashburn also discloses a second detector is being configured for a different resolution (Col. 7 lines 11-14). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the arrangement for the detectors as suggested by Ashburn in view of keeping a constant fixed radial distance as suggested by Ashburn.

However, Ashburn omits a collimator. Gagnon discloses a collimator is known for permitting a greater percentage of incident radiation to reach the surface of the detector (Paragraph 0011). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a collimator for detection purposes.

With respect to Claim 12, Marks discloses a second toroidal housing 12 for CT system, thus comprising a second modality compared to the first system 14 (Col. 3 lines 43-47). The second housing is at a fixed distance from the first housing, as evident from Fig. 1.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ashburn (US 6,147,352) in view of Gagnon et al. (EP 1008865, hereafter Gagnon) and further in view of Balan et al. (WO-00/75691, hereafter Balan).

With respect to Claim 16, Ashburn is silent with regards to a CT scanner including a transmission radiation source and a transmission radiation detector on the

rotatable gantry. Instead, Ashburn only discuss a single imaging modality of SPECT detectors on the gantry. Balan teaches a combined gamma camera and CT system with SPECT detectors 12, 14 mounted on the same gantry 22 as the transmission source 18 and transmission detector 20 (Figure la). In this manner, SPECT data obtained can be complemented by the X-ray attenuation data derived from the CT scan (page 18, lines 15-19). Further, since the imaging data acquired for both modalities occurs on the same gantry, alignment between the imaging data is simplified (page 2, lines 7-11; page 20, lines 14- 31). Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to provide a CT scanner integral with the SPECT detectors on the same gantry, so as to allow for complementing the SPECT data with the X-ray attenuation data (i.e. attenuation correction) while facilitating alignment between the acquired data, as taught by Balan et al.

Response to Arguments

4. Applicant's arguments with respect to claims 1-30 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mindy Vu whose telephone number is 571-272-8539. The examiner can normally be reached on M-F 9am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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